

A Stated Preference (SP) Study on Better Public Transport Service

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Abstract: *The population density in cities brings the necessity of making large-scale urban infrastructure investments for the sake of the residents. As a result of unplanned or uncontrolled growth of the city, heavy traffic jams are experienced in cities. In this study, it has been investigated how much public transport users and private vehicle users can pay for a better public transport system. Thus, it can be estimated the possible economic effect of the improvements. Within the context of the study, the scoring of the public transport system by private vehicle users and public transport users and the additional payment they can pay for better conditions were asked. The determining criteria are waiting time at the bus stop, safety, crowdedness, stress free travel, and long travel time. According to the results of the analysis, while private vehicle users generally evaluated the public transportation system as worse, they stated that they could pay more for better conditions than the public transportation system users.*

Keywords: Stated preferences, Survey analysis, Public transport, Quality of public transport service

1. Introduction

The world population is becoming more and more urbanized. In addition to natural population growth, population density is experienced in cities due to migration from rural areas to urban areas. United Nations' report claims that spatial and urban planning, as well as governmental and private expenditures in buildings and infrastructure, all influence urbanization. Cities become centers for the movement of transportation, trade, and communication as a growing percentage of economic activity and innovation is concentrated in them. Cities also become sites where high-quality public and commercial services are provided, and basic services are frequently more accessible than in rural regions (United Nations (UN), 2019). In the same report, it is emphasized that more over two-thirds of the world's population (70%) resided in rural areas in 1950. For the first time in history, the worldwide urban population surpassed the global rural population in 2007, and the global urban population has continued to expand faster than the global rural population since then. The proportion of the world's population living in cities is anticipated to reach 60% by 2030. By 2050, it is expected that the globe will be more than two-thirds urban (68%) (UN, 2019).

Population density in cities brings the necessity of making large-scale urban infrastructure investments for the sake of the residents. Since the rate of urbanization is generally higher than the rate of infrastructure construction, urbanization is distorted and disruptions occur in provided basin services such as transportation, water and electricity. In addition, due to the fact that new settlements are built on the periphery of the city, travel time increases between the city center and the residential area. As a result of unplanned or uncontrolled growth of the city, heavy traffic jams are experienced in cities. Traffic congestion has a certain cost to cities and residents. As Statista (2020) shares that according to INRIX which provides statistical information about cities' traffic, New York wasted \$11 billion last year due to traffic congestion, the biggest expense of any major American

metropolis. Los Angeles, which is infamous for its traffic congestion, came in second with just over \$8 billion in losses, while Chicago came in third with \$7.6 billion losses (Statista, 2020).

To avoid traffic congestion and manage the rising demand for mobility, efforts are being made to limit the usage of private automobiles in cities and improve the rate of use of public transit. Therefore, a quality system should serve. It has been observed that those who are not satisfied with the previous public transportation system are satisfied with the new service after the free fee application and this situation continues after the incentive implementation (Abou-Zeid and Fujii, 2016). All in all, better public transport service attracts more users. It may be necessary to pay more for a better public transport system. In this case, what should be the new fare should be analyzed so that public transport users do not tend to shift to use private vehicles. In this study, it has been investigated how much public transport users and private vehicle users can pay for a better public transport system. Thus, it can be estimated the possible economic effect of the improvements. In the literature, many studies are carried out on the perception and travel satisfaction. Abenoza et al. (2017) aim to identify and profile present and future users of public transportation in Sweden, as well as to determine the most important factors of trip satisfaction with public transportation services for each segment of passengers.

In the next part of the study, the study area will be described and brief information will be given. In the following section, the survey analysis will be explained and details about the questionnaire will be presented. Moreover, in the fourth part of the study, the results obtained from the survey will be evaluated, and in the conclusion part, the policies that should be followed according to results will be discussed.

2. Study Area and Survey Design

Study Area

Istanbul is the most crowded city of the Türkiye and the population of Istanbul in 2020 is 15, 462, 452 according to Turkish Statistical Institute (TUIK (a), 2021). While there was an increase of 29.5% between 2018 and 2019 years, the population decreased by 3.7% between 2019 and 2020 for the first time after 2001. This is because of the pandemic that people tend to move to the rural areas. However, it can be considered as a shock effect on the residents. Because, it is a special city where located in Asia and European continents. Istanbul is the most industrialized city of the Türkiye, and the biggest economic power of the country. Furthermore, according to the GDP calculations at the provincial level at current prices; in 2020, Istanbul reached the highest GDP with a share of 30.1% from the total GDP (TUIK (b), 2021).

A face-to-face survey was conducted with a total of 175 people in Istanbul. The surveys made are the most popular centers of the city. At the same time, these centers have strong connections with the public transport system. In these centers, surveys were conducted with both private vehicle users and public transport users. The surveys were made with randomly selected people.

Survey Design

The surveys were conducted with two groups as private vehicle users and public transport users. In the study, it was asked how much additional payment they could make for private vehicle users to provide a transport infrastructure where they could travel better. Private vehicle users were also asked how much they could pay if the public transport system was better, and in which case they could switch to the public transport system.

Private vehicle users were asked questions as in Table 1. The point to be considered in these questions is how much additional payment the users can make in order to reduce the waiting time in the current traffic and for how many minutes for waiting in traffic. In other words, users are not given a certain set of options here. Thus, we have learned the desired waiting time in traffic and the extra payment that each user can pay.

Table 1: Question set for private vehicle users

Private vehicle users (Please, fill in the blanks.)	Questions
Punctuality (desired waiting time in traffic)	For ... minutes to wait in traffic, I would pay extra Turkish Lira (TL).
Safety in traffic	I would pay extra ... TL for safe traffic
Traffic jam	I would pay extra ... TL for better Level of Service.
Stress, annoyance	I would pay extra ... TL for stress free travel.
Long travel time	I would pay extra ... TL for shorter trips.

Similar questions were asked to public transport users, as well. However, within the scope of punctuality, private vehicle users were asked about the waiting time in traffic, while public transport users were asked for arriving of the

public transport vehicles at the stops on time. The question analyzes the amount of the additional payment of users for shortened waiting time at the stop. Moreover, the question for private vehicle users about the traffic jam is modified and asked to public transport users as the situation of being crowded in public transport vehicles. Other questions are common questions.

The questions asked to public transport users are given in Table 2.

Table 2: Question set for public transport users

Public transport users (Please, fill in the blanks.)	Questions
Punctuality (desired waiting time in stop/station)	For ... minutes to wait in stop, I would pay extra TL.
Safety in traffic	I would pay extra ... TL for safe public transport
Crowdedness	I would pay extra ... TL for seat available public transport.
Stress, annoyance	I would pay extra ... TL for stress free travel.
Long travel time	I would pay extra ... TL for shorter trips.

3. Survey Analysis

The average age of the people surveyed is 29.7. The youngest person participating in the survey is 15 years old, while the oldest is 68.67% of the people surveyed are men and 33% are married. In addition, the average household size is 3.09.69% of the respondents are workers and 50% are homeowners.45% of the participants own a private vehicle. Finally, according to the survey results, the monthly average household income is 5, 300 TL. The amount of the income is for the year 2015 when the study was conducted.

The 45% of the trips originated in European continent and 45% of these trips destined in Asia side. Namely, these trips can be made by private vehicle by using one of the two bridges or Avrasya tunnel connection, Marmaray connection which is rail connection or sea ports. The 35% of the total trips are made between the continents. The details and distribution of the trips according to the origin and destination is given in Figure 1.

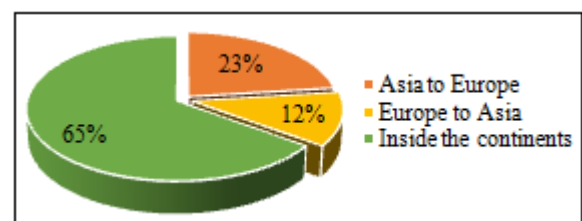


Figure 1: Origins and destinations of the trips

As the trips are examined according to their purpose, it is seen that 41% of the trips are home based work trips. Although 45% of the people surveyed have a private car, the rate of those who travel only with their private car is 20%, and the rate of people who use the park and ride system is only 6%.

4. Results

Private vehicle users were also asked to evaluate the public transport system. Table 3 shows the scores of private vehicle

users and public transport users on average for each indicator of the current system and the amount of money they can pay for extra for better condition.

Table 3: Score and additional payment of the users

Evaluated Indicators		Total sample	Private car users	Public transport users
Waiting time at the stop	Current mode score (Average)	3.13	2.86	3.21
	Additional payment (TL)	1.07	1.57	0.93
Safety	Current mode score (Average)	2.47	2.69	2.37
	Additional payment (TL)	1.97	2.57	1.8
Crowded	Current mode score (Average)	1.93	2.16	1.82
	Additional payment (TL)	2.45	4.13	1.92
Stress free travel	Current mode score (Average)	2.33	2.32	2.3
	Additional payment (TL)	2.61	4.04	2.17
Long travel time	Current mode score (Average)	2.43	2.37	2.43
	Additional payment (TL)	2.77	4.7	2.17

Waiting time at the stop: The number of people traveling with their private car is 45 out of 175 answers. Some of these people stated that they had used the public transportation system before, and some of them stated that they had never used it before. If they use the public transportation system, the average time they think they will wait at the stop varies between 2 and 30 minutes, with an average of 11.7 minutes. In addition, private vehicle users consider the time they wait at the stop at a medium-low level and score an average of 2.86 points. On the other hand, for 130 people who use the public transportation system, the time they wait at the bus stop varies between 0 and 40 minutes, with an average of 8.8 minutes. Waiting time at the stop receives an average of 3.21 score from public transport users. In this case, private vehicle users think that they will wait longer if they prefer the public transportation system. According to private vehicle users, the waiting time at the stop should be at most 4.8 minutes on average. They stated that they could give an average of 1.57 TL in addition to the one-way trip cost. In addition, according to public transport users, the waiting time at the stop should be 3.9 minutes on average, and they are willing to pay an average of 0.93 TL extra for better condition.

Safety: According to private vehicle users, the average score of safety in the public transport system is 2.69, while it is 2.37 on average according to the users of the public transport system. Private vehicle users are willing to pay an average of 2.57 TL on average for more safety, while public transport users are willing to pay an average of 1.80 TL. This is due to the difference in income level. While the average monthly income of private vehicle users is approximately 7, 471 TL, the average monthly income of public transport users is approximately 4, 551 TL. Since they have approximately 1.5 times more income, private car users do not hesitate to give more money.

Crowded: Private vehicle users do not think that the public transport system is too crowded as much as public transport users. While the average score of the crowd is 2.16 according to the private vehicle users, it is 1.82 on average according to the public transport users, that is, it is in a very bad condition. However, as a result, both groups stated that a crowded public transportation service is provided and the size of the crowd was in a "bad" condition. While public

transport users are willing to pay an average of 1.92 TL to have the opportunity to sit at all times, private vehicle users are willing to pay an average of 4.13 TL despite not using the public transport system. Although this situation also depends on income, it is thought that private vehicle users generally think that the crowdedness of the public transport system is a prominent feature.

Stress free travel: According to the answers given to the questions about the effects of the mode of transportation used, such as stress, tension, loss of motivation, it is seen that both private vehicle users and public transportation system users think that this mode of transportation causes bad feelings. Those who travel by private vehicles give the public transportation system an average score of 2.32, that is close to "bad", for these reasons, while the score given by the public transportation users is very close to "bad" as well and appears to be an average of 2.30. In order to have a more stress-free travel, private vehicle users can afford to pay an average of 4.04 TL, while public transport users state that they can afford to pay an average of 2.17 TL. From the answers given by the public transport users and the comments they made while conducting the survey, it can be concluded that the public transport users are used to the current system and have adopted the current situation. As a result, public transport users willing to pay less money than private vehicle users, due to their income status.

Long travel time: The average score for "long travel time" of private vehicle users was calculated as 2.37, and the average score of public transport users was calculated as 2.43. In addition, to eliminate the long travel time, the additional payment for a shorter distance trip is 4.70 TL on average for private vehicle users, while it is 2.17 TL on average for public transport users.

5. Conclusion

Private vehicle users and public transport system users were asked to evaluate the public transport system. While making this evaluation, they were asked to score the public transportation system within the framework of the determined criteria and the amount of money they could pay to operate it under better conditions. The findings of the

study of Abenoza et al. (2017) imply that the relevance of service qualities is consistent across passenger segments. However, according to the results obtained, the public transportation system is perceived to vary according to the types of users. It has been revealed that the reason why private vehicle users do not prefer the public transportation system is because they do not find the public transportation system of sufficient quality and evaluate it worse than those who use the public transportation system.

Increasing the quality of the public transportation system at a level that will be attractive to private vehicle users should be one of the most important policies. People should feel safe in public transportation vehicles, long journeys should be avoided, and waiting time at the stops should be reduced. Public transportation system users mostly prefer the public transportation system because they have no other alternatives. By increasing the satisfaction of both public transport users and private vehicle users, the quality of life in the city in general can be increased.

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